BIOGEN

A SPECULATION ON THE

ORIGIN AND NATURE OF LIFE

By PROFESSOR ELLIOTT COUES

MEMBER OF THE NATIONAL ACADEMY OF SCIENCES; OF THE AMERICAN PHILOSOPHICAL SOCIETY; OF THE PHILOSOPHICAL AND BIOLOGICAL SOCIETIES OF WASHINGTON; ETC., ETC.

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THE DÆMON OF DARWIN

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TO

WILLIAM B. TAYLOR,

LATELY PRESIDENT OF THE PHILOSOPHICAL SOCIETY OF WASHINGTON,
LEARNED IN SCIENCE, WISE IN PHILOSOPHY,
FAITHFUL IN ALL LIFE'S RELATIONS,

This Volume is Inscribed

WITH RESPECT AND FRIENDSHIP

BY

THE AUTHOR.

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"The moſt general truth, not admitting of incluſion in any other, "does not admit of interpretation. Of neceſſity therefore, explanation "muſt eventually bring us down to the inexplicable. The deepeſt truth "we can get at muſt be unaccountable."

H. SPENCER.

"He who ſuppoſes, therefore, 'that the information of the ſenſes is "'adequate (with the aid of mathematical reaſoning) to explain phe-"'nomena of *all kinds*,' who refuſes to admit 'that there are phyſical "'operations which are and ever will be incomprehenſible by us,' betrays "a very imperfect idea — no leſs of the impaſſable limitations of finite "intellect, than of the fathomleſs profundity of Nature's ſyſtem. He "who thinks that by formally repudiating the myſterious, and confidently "diſcarding the unknown, he thereby aboliſhes or in the ſlighteſt degree "diminiſhes his inſuperable neſcience of the ultimate, — but imitates "the oſtrich, and deludes himſelf."

W. B. TAYLOR.

PREFACE.

IN the ſpring of 1882 I was honored by an invitation, which I did not feel at liberty to diſregard, from the Preſident of the Philoſophical Society of Waſhington, to addreſs that learned body upon the general problem of Life — Whence, What, How, and Why.

The faſcination of theſe queſtions, perpetually aſked and unanſwered, is due to the fact, that we know them to be unanſwerable, yet feel that they will be anſwered ſomewhere, ſomehow, ſometime, by every human being, each for himſelf.

The ſituation at the Philoſophical Society I was given to underſtand to be this: The retiring Preſident had in his laſt addreſs diſcuſſed biology, contending that a certain "vital principle" cauſed Life, or was at any rate neceſſary for the purpoſes of Living. This would ſeem to be a reaſonable propoſition; but it had been regarded as more or leſs unphiloſophical or unſcientific, becauſe the Society had not ſucceeded in finding out what the vital principle was, or indeed, where to find it at all. Mathematics had failed to find it at any point in the known dimenſions of ſpace. Phyſics

had failed to find it in any kineſis of attraction and repulſion. Chemiſtry had failed to find it in any atomic or molecular combination. Then Biology — "The Science of Life" — had come to the reſcue with a ſubſtance known as Protoplaſm; for Phyſics had proven that nothing exiſted but matter in motion; Chemiſtry had proven that protoplaſm was matter in motion; Biology had proven that Life was a mode of motion of matter; *ergo*, protoplaſm was the vital principle; and it had been juſt upon the point of being diſcovered by the Society, when the protoplaſm, which the Society had examined, died. So the vital principle had given them the ſlip, and the Phyſico-chemical Theory of Life had been unable to recover the ſame. It having thus become evident that there was a difference between ſomething alive and the ſame thing dead, the "previous queſtion" had obviouſly recurred.

I prepared what I had to ſay on the ſubject to the beſt of my ability, and carried it to the Society with much miſgiving. For I could not ſay what I truly thought — and what elſe ſhould any man ſay? — without introducing ſtrangers to a ſelect body of Waſhington ſcientiſts — ſuch as God, Spirit, and Soul, as factors in the problem of Life. Truſting, however, that their names were known, at leaſt, I delivered the addreſs ſubſequently entitled "Biogen."

No one who has frequented ſcientific ſocieties can have failed to obſerve how naïve and natural are our exhibitions of human nature. We "elder children" cannot be outdone by the youngeſt in our harmleſs vanities. When ſome one is ſpeaking, for example, we who are liſtening are buſy with our pencils and note-books. To put down the beſt things he ſays? To put down the good

things even? Why ſhould we? Theſe things take care of themſelves, do they not? We watch him like a hawk, to pay ourſelves for having to liſten; to catch him tripping, and find fault with him afterwards, and have an excuſe for ſpeaking ourſelves. We are all too full of our own ideas to liſten to any one's elſe for any othe purpoſe, or on any other terms. We immediately riſe to compliment the ſpeaker with the moſt glittering generality, before confounding him with the utmoſt particularity. What could be more ſimple, more natural, more human, more child-like?

On the occaſion to which I refer, for example, a philoſopher ſaid that he had liſtened to the, etc., addreſs of the, etc., with the greateſt, etc. But the ſpeaker had adduced the conſenſus of mankind in ſupport of his views, and the conſenſus of mankind was demonſtrably erroneous in many particulars. For example, take the rainbow, which mankind had for years believed to be ſet in the ſky by the Deity, as a thing of beauty, and a token, and a promiſe. Whereas the triumphant progreſs of modern ſcience had ſhown its ſhape to be due to the circular equality of angle in this locus of the water-ſpherules, and its color to the varied refraction of light. For the reſt, he could only refer the ſpeaker to the well-known properties of protoplaſm, and the modern theory of evolution.

A philoſopher, waiving the uſual opening formula, ſtated without reſerve that there could not be anything in anything he had heard me ſay, becauſe nothing exiſted but matter in motion.

A philoſopher ſaid that he could not imagine how the ſpeaker could ſeriouſly aſk ſuch a queſtion as, What is the difference between a dead Amœba and a live Amœba? He ſhould be almoſt

aſhamed to be called upon to anſwer ſuch a ſimple queſtion. From his manner I gathered that he wiſhed I had aſked him ſomething hard.

A philoſopher hoped that Profeſſor Coues did not teach ſuch hereſies at the college where he habitually lectured.

A philoſopher of an inquiring turn of mind, apparently, ſaid that I had ſpoken of "ſoul" and "ſpirit" as of things whereof a man might poſſeſs more, or leſs; but that, if ſo, my views would remain without ſcientific baſis until the invention of a "biometer" to meaſure the cubic contents or avoirdupois of a man's ſoul-ſtuff. Upon which I could not help thinking, and ſaying, that an inſtrument for meaſuring the ſoul ſhould be the laſt thing ſome philoſophers ſhould wiſh to ſee invented — and applied.

A different kind of a philoſopher ſpoke for a few moments. I will not tranſcribe his remarks. Our eyes met, and I knew he underſtood me. But the pertinence of moſt of the remarks which followed the delivery of "Biogen" muſt be left to the reader to diſcover, upon peruſal of the publiſhed minutes of the meeting (ſee Introduction). The general ſenſe of the meeting was probably reflected in the remark made privately to me by one of my friends: "Damn good Engliſh, Coues, and damn poor ſenſe. You ought to get to be a good ſquare flat-footed atheiſt, and then you won't take theſe fits."

When the queſtion of publiſhing "Biogen" came up, I aſked the advice of one who I knew would endeavor to diſſuade me, in order to learn his reaſons. He begged me not to publiſh it, for my own ſake, becauſe it would "injure my ſcientific reputation." Acting

upon this advice, and wiſhing to diſcover, if poſſible, how an honeſt expreſſion of honeſt convictions on any ſubject could injure any one's reputation for anything excepting inſincerity, I immediately printed a ſmall edition which was ſpeedily exhauſted.

The treatiſe having found favor in ſome eyes in whoſe penetration I have confidence is now republiſhed without other change than the addition of this Preface, the following Introduction, an Appendix, and ſome foot-notes here and there. Should the line of thought preſented be found to lead, or even to tend, in the right direction, it may be followed up hereafter; the Author being now in poſition to expreſs himſelf more fully, freely and explicitly on the ſubject than he was when "Biogen" was firſt publiſhed.

Living as I have been for many years in a ſcientific atmoſphere in which atheiſm and a very craſs materialiſm are rife, as the faſhionable foibles of many men otherwiſe really great, who almoſt hide their folly with their erudition, their good ſenſe, their thouſand manly and humane qualities, I am often told by ſcientiſts that they have no ſouls, and expect to die like dogs. What can I rejoin to ſuch declarations from ſuch ſources? To ſuch a one I can only anſwer evaſively, that he muſt know his own nature, and probable deſtiny, better than he can expect me to; and that if he thinks he has no ſoul, and is to die like a dog, I have no means of proving him wrong; but that, ſpeaking for myſelf alone, I know that I have a ſoul, and that I ſhall not die like a dog, becauſe it is the nature of the ſoul God has given me to know its immortal ſelf with a kind of knowledge in compariſon with which the knowledge of material things acquired by the bodily ſenſes is no knowledge,

but deluſion only — with a kind of knowledge whoſe ſervant, not whoſe maſter, is reaſon — with a kind of conſciouſneſs which is ſelf-conſcious.

If my philoſophy approves this conſciouſneſs, if my ſcience ſupports and ſtrengthens it, I am happy. If they do not, of what uſe are they to me? Idle, waſteful ſlaves, that eat into the life and ſubſtance of their maſter — not worth their keep.

Not many men, I fear, think; it tires them, and hurts their feelings; it ſtrains their conſtitutions; a more or leſs ſequential ſeries of bodily ſenſations is an eaſier way through life, that "embarraſſing predicament which precedes death," and ſaves the trouble of thinking. A few men think, and their hard thinking hardens the brain, and ſets it in a mould, and no thought of another ſhape can find fit or rest there. And the ſpider of vanity ſpins her web there, and nimbly traverſes its geometric threads, and lo! a ſyſtem of philoſophy. But ſuch ſhall paſs alſo, brother philoſopher; your ſcience and mine muſt bend the knee to our common humanity, there to learn that knowledge is not wiſdom till it becomes ſelf-knowledge, nor this maſterful till it has maſtered ſelf. *Then*, — forge the chains of your ſyſtems as you may; the verieſt goſſamer thread ſhall be ſtronger to bear you up than they to hold you down.

INTRODUCTION.

(*Extracted from the Bulletin of the Philosophical Society of Washington*, vol. v, pp. 102–105.)

"217th MEETING. MAY 6, 1882.

"President WM. B. TAYLOR in the Chair.

. . . . . .

"The first communication was by Mr. ELLIOTT COUES,

"ON THE POSSIBILITIES OF PROTOPLASM.

"The following is an abstract of this communication which has "been published at greater length under the title — 'Biogen: a "'Speculation on the Origin and Nature of Life.' Abridged from "a paper on the 'possibilities of protoplasm,' read before the Philo- "sophical Society of Washington, May 6th, 1882. Washington: "Judd & Detweiler. 1882. 8vo, pp. 27.

"Referring to previous papers on the subject of Life, by Mr. "WOODWARD and Mr. WARD, the speaker opposed any purely "physico-chemical theory, and adhered to the doctrine of the actual "existence of a 'vital principle.' Granting that all substances, in-

"cluding protoplaſm, have been evolved from nebulous matter; "that evolution to the protoplaſmic ſtate is neceſſary for any mani- "feſtation of life and even that life neceſſarily appears in matter "thus elaborated, it does not follow that the reſult of the proceſſes "by which matter is fitted to receive life is the *cauſe* of the vitality "manifeſted. For all that is known to the contrary protoplaſm and "vitality are ſimply concomitant; or if there is any cauſal relation "between them, vital force is the cauſe of the peculiar properties of "protoplaſm, not the reſult of those properties. There really exiſts "a potency or principle called 'vital,' in virtue of which the chemi- "cal ſubſtance called protoplaſm manifeſts vitality, that is to ſay, *is* "*alive*, and in the abſence of which no protoplaſmic or other mo- "lecular aggregation of matter can be alive. The chemico-phyſical "theory ſimply reſtates abiogeneſis, or 'ſpontaneous generation,' of "which we know nothing ſcientifically. The grave doubt that "'life is a property of protoplaſm' will perſiſtently intrude until "ſome one ſhows what is the chemico-phyſical difference between "living and dead protoplaſm; none being known.

. . . . . .

"The ſpeaker argued for the exiſtence of the ſoul as ſomething "apart from and unlike matter, defining 'ſoul' as that quantity of "ſpirit which any living body may or does poſſeſs. No idea can "attach to the term 'ſpirit,' from which all conceptions of matter "are not abſolutely excluded. Spirit is immaterial ſelf-conſcious "force; life conſiſts in the animation of matter by ſpirit.

"The ſubſtance of mind and the ſubſtance of matter were noted as "equally hypothetical. To the former was given the name *Biogen*,

"or ſoul-ſtuff, and it was defined as ſpirit in combination with the "minimum of matter neceſſary to its manifeſtation. The analogy "between biogen and luminiferous æther, or the hypothetical ſub- "ſtance of light, was diſcuſſed. The drift of the ſpeaker's ſpecula- "tion on the vital principle as an *ens realiſſimum* was toward a "reſtatement, in ſcientific terms, of the old *anima mundi* theory. "Modern materialiſtic and atheiſtic notions about life were de- "nounced as every one of them diſguiſes of the monſtrouſly abſurd "ſtatement that a ſelf-created atom of matter could lay an egg that "would hatch.

"The whole matter being beyond the ſcrutiny of the phyſical "ſenſes is remote from the ſcope of exact ſcience; but it is irra- "tional and unſcientific to deny it, as is virtually done when ſcience "excludes it from any ſhare in life-phenomena, by preſuming to "explain life upon purely material conſiderations. No chemico- "phyſical theory of life is tenable which does not ſatisfactorily ex- "plain the difference between, for example, a live amœba and a "dead one; an explanation which has never yet been, and probably "cannot be, given.

"A general diſcuſſion of the points involved in this paper fol- "lowed. Mr. POWELL pointed out what he regarded as a funda- "mental and fatal error in the reaſoning, viz., that the axiom that "the whole equals the ſum of all its parts, had been aſſumed "throughout to be true *qualitatively* as well as quantitively. Fur- "thermore, he maintained that logical conſiſtency required that "thoſe who believed in force ſhould alſo believe in the vital prin- "ciple, and *vice verſa*. As for himſelf, however, there was neither

"force nor vital principle, but only matter in motion. Three rela-
"tions are always to be borne in mind, viz., quantity, quality, and
"ſucceſſion, whereas the phyſiciſt falls into error by conſidering
"only the quantitive relation.

"So much of the ſupport of the views of Mr. COUES as might be
"derived from the common conſenſus of mankind was criticiſed
"by Mr. GILL as unſound, ſince the common conſenſus of mankind
"has often been found at fault; the ſuppoſed flatneſs of the earth,
"the motion of the ſun around the earth, etc., are examples where
"this criterion fails. Paraphraſing an eminent philoſopher's dic-
"tum, he thought there was a tendency of biologiſts ignorant of phi-
"loſophy and philoſophers ignorant of biology to make a diſtinction
"between organic and inorganic matter, and call in a 'vital force.'
"He likened living and dead protoplaſm to an electric battery in
"action and at reſt, and maintained that life is a property of matter,
"and that it cannot be conceived of ſeparated from matter.

"Mr. HARKNESS avowed his belief in force, and hence in vital
"force, and further in a little religion, and was, therefore, moved
"to make inquiry concerning the chemical difference between liv-
"ing and dead matter.

"Mr. WARD pointed out that very diverſe views were held upon
"this ſubject by two claſſes of thinkers who do not come into intel-
"lectual contact. Furthermore, while not aſſerting that vital force
"was a ſuperſtition, attention was drawn to the fact that infantile
"races attribute all phenomena to ſupernatural agencies, and that,
"with increaſing knowledge, there is a decreaſe in the number of
"theſe appeals to ſupernatural agencies.

"The corner-ſtone of modern ſcience, ſaid Mr. DOOLITTLE, is "*meaſure.* We muſt have a biometer. What electrical ſcience "would be without ohms, aſtronomy without graduated circles, "chemiſtry without the balance, ſuch is biology without a *meaſure.* "Is there more life in two mice than in one mouſe? In a horse "than in a mouſe? Until we can anſwer theſe queſtions ſubſtantial "progreſs in biology is not to be expected.

. . . . . .

"After ſome further deſultory diſcuſſion the Society adjourned."

BIOGEN.

Mr. Preſident and Gentlemen of the Society:

ANY reaſon I might have found for declining your invitation to ſpeak on this ſubject could only have come from moral cowardice. I ſhould have had, therefore, no alternative to compliance, even had I had no courage to proceed but that of conviction. But I was given to underſtand that you might neither be unwilling to have the general biological problem reopened, nor indiſpoſed to hear with forbearance at leaſt from any one of your number who might have ideas upon the ſubject, with a view to diſcuſs ſuch propoſitions as he might be willing and able to advance.

So far am I from ſuppoſing that the *crux* of the life-problem will be ſolved to-night, I do not heſitate to declare my belief that it has been reſolved neither by ſcience nor by philoſophy, and that it is inſoluble in any royal water that can be

compounded of to-day's ſcience and philoſophy. Confronted as I am with ſomething I believe to be inſcrutable to man's unaided reaſon — oppoſed as are my convictions to ſome of the brave theories which have been advanced in this Society reſpecting that ſomething — profoundly unknowing as I am of the origin and nature of Life, I ſhould deſiſt with this honeſt confeſſion of ignorance and ſeek its aſylum, were I not alſo convinced that much truth in the matter of the life-problem is to be had for the aſking by any one who makes full uſe of *all* his faculties; were not my views in the main thoſe which, in ſubſtance, under whatever form of expreſſion, have been affirmed by the conſenſus of mankind ſince when the human creature became poſſeſſed of a rational ſoul; and were I not ſatisfied that anything I could ſay, ſeeming new and being true, would be no news, but ſomething as old as the mind of man.

In expreſſing one's ſelf upon matters which are rather thoſe of reaſonable inference than of demonſtration, there is danger of dogmatizing juſt in proportion to ſtrength of belief; but that unſcientific, unphiloſophical, and offenſive practice is avoided when individual convictions are given with the reaſons upon which they are baſed, with perfect intellectual candor, with deſerved contempt for mere logomachy, and with due deference to thoſe different opinions which may be

but varying views of a ſingle many-ſided truth. In ſuch ſpirit as this, I beg your indulgence in a train of thought not put together to ſuſtain any theory of my own, but to diſcover truth, if poſſible.

It cannot be amiſs to bring up certain papers lately laid before the Society, and treat them as if under diſcuſſion to-night. One of theſe is Dr. J. J. Woodward's addreſs, as the retiring Preſident, on "Modern Philoſophic Conceptions of Life," and others are Mr. Leſter F. Ward's, on the "Evolution of the Chemical Elements" and of the "Organic Compounds." If I correctly appreciate their reſpective ſignificance, they embody oppoſite and probably irreconcilable views — Mr. Ward ſetting forth the chemico-phyſical theory of life, and Dr. Woodward inclining to what may be termed the vitaliſtic theory.*

* The ſpeaker quoted as follows from Dr. Woodward's publiſhed addreſs: —

P. 18. "I have already aſſerted that there are whole groups of phenomena characteriſtic of living beings and peculiar to them, which cannot be intelligently explained as the mere reſultants of the operation of the chemical and phyſical forces of the univerſe. Theſe phenomena I refer — I own it without heſitation — to the operations of a vital principle, in the exiſtence of which I believe as firmly as I do in the exiſtence of force, though I do not know its nature any more than I know the nature of force."

P. 20. "I willingly admit that, in view of our preſent notions of the

As a maſter of many departments of ſcience, and in a maſterly manner, Dr. Woodward appears to have reviewed much that is actually known of the conditions and manifeſtations of life, with a fair ſtatement of much that is unknown, arguing againſt the adequacy of the chemico-phyſical theory, maintaining the exiſtence and operation of a "vital principle," and declaring that while the idea of a univerſal creative mind has claims to be a tenable ſcientific hypotheſis, neither ſcience nor philoſophy affords any proven baſis for the moſt univerſal

coſmogony, it is impoſſible to believe that life always exiſted upon this planet. I willingly admit that life on the earth muſt have had a beginning in time. But we do not know how it began. Let us honeſtly confeſs our ignorance. I declare to you I think the old Hebrew belief, that life began by a creative act of the Univerſal Mind, has quite as good claims to be regarded a ſcientific hypotheſis, as the ſpeculation that inorganic matter ever became living by virtue of its own forces merely."

P. 20. There is . . . "a philoſophy which recognizes the validity of the mind's ſelf-conſciouſneſs as at leaſt fully equal to the validity of its conſciouſneſs of the conditions of the body by which it obtains a knowledge of the external world. By this ſelf-conſciouſneſs I know, with a certainty which no doubt can ever diſturb, that I have a mind; and by rightly applying my reaſoning powers to the data of my ſelf-conſciouſneſs I can learn much that will be uſeful to me with regard to my mental proceſſes and the methods of applying them. But here I have to ſtop. I can learn nothing, whether by conſciouſneſs or by reaſoning, with regard to the real nature of my conſcious mind, and however much it may long for immortality, neither philoſophy nor ſcience afford any foundation of proof upon which it may reſt."

of human beliefs — the exiſtence in man of an immortal ſoul. Paſſages that have been quoted ſhow their author to be ſatiſfied of the inſufficiency of ſcience and philoſophy to explain the myſtery of life, and ſo explain himſelf to himſelf; ſo that, if he deſires that which moſt men deſire, he muſt look elſewhere for the ſatisfaction of that deſire. I doubt not moſt honeſt thinkers have found preciſely the ſame difficulty. It is a very grave one, which uſually increaſes, inſtead of diminiſhing, the farther we go in the curriculum of the natural ſciences in our reliance upon "pure reaſon" — a lamp which finally ſerves not to light the way, but only to make the darkneſs viſible.

I recur in the ſequel to what I underſtand the "vital principle" to be. But firſt to touch upon the "chemico-phyſical theory of life," as maintained by Mr. Ward, who needs no reaſſurance of the profound reſpect I have for his intellectual proceſſes, widely as we differ reſpecting the validity of his reſults; whoſe logic is ſo clear and cogent, whoſe illuſtration is ſo lucid and copious, that his concluſions would be inevitable were his poſtulates admiſſible. The flaw ſeems to be in the indictment by which matter may literally be ſaid to be put on trial for its life. The central idea of his papers on the evolution from nebulous matter of the chemical elements and all other known forms is, — progreſſive increaſe in complexity of the molecular units of all ſubſtances, with correſpond-

ing increment of molecular maſs and correſponding decrement of ſtability of combination * — ſuch molecular aggregates progreſſing in inſtability until a ſtage is reached where the reſulting aggregations, no longer molecular, but rather molar, are ſo unſtable that new and higher activities become poſſible, and perceptible molar movements may take place; theſe actually occurring at the ſtage of aggregation reached by the ſubſtance called "protoplaſm;" life conſiſting in ſuch mode of motion as the particles of protoplaſm manifeſt, and being therefore a property of protoplaſm, an eſſential or intrinſic quality of matter, in virtue of its own mechanical and chemical forces; in other words, that life inheres in matter, and is ſimply the reſultant of material forces; "the moſt profound truth, both of biology and of chemiſtry," being, in Mr. Ward's view, "that life is the reſult of the aggregation of matter." †

* The expreſſion of this idea aſcribed to Socrates by Plato is, — that compounded things, or ſuch as are compoundable, *admit of being diſſipated at the ſame rate that they were compounded.*

† The propoſitions above ſtated are ſummed in their author's own words as follows: —

"The general law above ſtated, that in the progreſs of the evolution of matter from the ſimpleſt elemental ſtate to the moſt complex organic compound, there has conſtantly been increaſe in the maſs and decreaſe in the ſtability of the molecules, holds good throughout; and to it may now be added a third principle, obviouſly correlated to the above and conſtituting merely a corollary to it, that *pari paſſu* with theſe changes there has

I have never ſeen elſewhere ſo fair a ſtatement of the chemico-phyſical theory, ſo ably ſupported; and the chain of reaſoning by which diffuſe nebulous matter is linked to the tiſſue of living things appeals to my mind with great cogency. But I think the lurking fallacy is no leſs dangerous than deplorable.

For, granted that all ſubſtances, including protoplaſm, have been evolved from nebulous matter; granted, that evolution to the protoplaſmic ſtate, and in the very manner claimed, is

been an increaſe in the activity of the properties manifeſted. . . . In protein bodies theſe molecular activities are much more extenſive and varied than are thoſe of ſimpler bodies. The molecular units are ſo much larger that their motions muſt be, as it were, *molar* in compariſon, while within theſe larger primary units there are leſſer units of different orders of aggregation, each of which manifeſts its own appropriate activities, and thus modifies the general properties of the whole. . . . From the molecule of hydrogen to that of albumen the proceſs of evolution has been uniformly the ſame, namely, that of compounding and recompounding, of doubly and multiply compounding: in ſhort, it has been the proceſs of molecular aggregation. It would be contrary to the law of uniformity in natural phenomena, upon the recognition of which modern ſcience is baſed, to aſſume an abrupt change in the proceſs at this point; and upon thoſe who maintain ſuch a *ſaltus* muſt reſt the burden of proof. . . . That the recompounding of the protein bodies ſhould reſult in a new form poſſeſſing the quality of ſpontaneous movement is *à priori* juſt as probable as that the addition of a molecule of oxygen ſhould convert the hydrides into alcohols."

required for any manifeſtation of life; granted even, that life always appears in matter thus elaborated; it does not follow, that the reſult of the proceſs by which matter is fitted to receive life is the *cauſe* of the vitality it manifeſts. Sequence is not neceſſarily conſequence; and in this caſe it does not ſeem that even a *poſt hoc*, much leſs a *propter hoc*, can be maintained. For all that is known to the contrary, protoplaſm and vitality are ſimply concomitant. If any cauſal relation is to be eſtabliſhed, it muſt be upon other conſiderations than have been preſented. I believe the relation to be cauſal, but the reverſe of that claimed; vital force being the cauſe of the peculiar properties of protoplaſm.

I adhere without reſervation to the doctrine that there really exiſts a potency or principle called "vital," in virtue of which the chemical ſubſtance called protoplaſm manifeſts the rudimentary phenomena of life; that is to ſay, *is alive;* and in the abſence of which no protoplaſmic or other molecular aggregation of matter can or does manifeſt ſuch phenomena; that is to ſay, *be alive*. Chief among the impoſſibilities of protoplaſm appears to me to be the ſpontaneous generation of life by any method of chemical or mechanical movement impreſſed upon matter by the operation of forces inherent in itſelf. That the chemico-phyſical theory is merely a reſtatement of the theory of "ſpontaneous generation" is

ſelf-evident, and the difficulty is increaſed by the aſſumption that mechanical and chemical conditionings of matter are adequate to reſult in life. It is an unqueſtionable ſcientific fact that ſpontaneous generation has never been demonſtrated to have occurred in a ſingle inſtance, with or without the operation of a vital force in addition to purely phyſical forces, though every ſuppoſed condition of vitality has been artificially brought about. The ſcientific fact is — and by ſcientific fact I mean ſomething poſitively known to be true — that life has never been aſcertained to have any other origin than in antecedent life. For all that is known to the contrary, ſuch antecedent is no leſs neceſſary to the exiſtence of vitality than is protoplaſmic matter neceſſary to the manifeſtation of vitality. The grave doubt that "Life is a property of protoplaſm," reſulting from the way in which the particles of that ſubſtance are aggregated and arranged, will perſiſt obtruſively, I think, until the chemico-phyſical theory accounts for the difference between a live amœba and a dead amœba. I ſhould ſay there is all the difference in the world, and that this difference is juſt the point at iſſue. Until that explanation is forthcoming, the theory mentioned remains not a logical inference, but a pure aſſumption — a hypothetical link in a chain of being found juſt too ſhort by one link.

I recognize the fact, which no biologiſt queſtions, that life

may and does precede "organization," and therefore exiſts in matter independently of organization. Since an amœba exhibits the rudiments of organization, having a nucleus and often a membrane in addition to its ſubſtance proper, let us take a ſtill ſimpler living thing — a plaſſon-body, which is merely a particle of animated matter, ſhapeleſs, ſtructureleſs, unorganized, and abſolutely homogeneous; yet manifeſting, for an allotted period, the phenomena neceſſary to any predication of life, namely: it moves, it feels, it feeds, it propagates, it may be killed; and theſe things could not be were it not alive. The phyſical properties of a plaſſon-body, which is ſimply unorganized protoplaſm, are well known to you. Its chemical compoſition, as given on good authority, is, in 100 parts, 54 of carbon, 21 of oxygen, 16 of nitrogen, 7 of hydrogen, and 2 of ſulphur. But, has a *living* plaſſon-body ever been reſolved into its chemical elements? I ſhould think it would be thoroughly killed before the analyſis were over. If ſo, living protoplaſm has never been and cannot be analyzed, and its compoſition remains unknown. For, according to the chemico-phyſical theory, it lives only in virtue of its peculiar chemical and phyſical conſtitution; it lives neceſſarily, ſimply becauſe it *is* protoplaſm; but, if ſo, protoplaſm is only itſelf when it is living; when it is dead, it is ſomething elſe; therefore, this ſomething elſe is what is analyzed; and in

what life conſiſts has eluded the proceſs. A contradiction in terms is here implied, and an abſurdity is made manifeſt; for if there be any knowable difference in chemical and phyſical conſtitution between a living and a dead cell, or other ſimple protoplaſmic body, ſuch difference is unknown; to all phyſical and chemical teſts that have been applied, they are identical. I anticipate the ready reply, that chemiſtry only claims to know what elementary ſubſtances, in what proportions, conſtitute protoplaſm, not pretending to ſay what particular manner of aggregation of their molecular units reſults in life. But ſuch anſwer, ſo far from doing away with a phyſical difficulty, ſeeks refuge in a metaphyſical ſubtlety. For if life neceſſarily reſulted from the compounding of certain elementary ſubſtances in certain proportions, and in a certain way, there is preſent and operative *ſomething* adequate to effect ſuch reſult, abſence or non-operation of which ſomething reſults in death. Becauſe, the moment theſe identical elementary ſubſtances, combined in the identical proportions, ſlip into any other way of molecular interaction and molecular inter-adjuſtment, they ceaſe to manifeſt the phenomena of life. What holds them juſt as they are in life, neither chemiſtry nor phyſics ſhows. I give reaſons, beyond, for aſſuming that the *ſomething* is that particular thing called vital force. This hypotheſis is *à priori* as legitimate and reaſonable as

any other can be in a caſe where all is as purely ſpeculative as any metaphyſical queſtion can be. For all that relates to the ultimate atoms of matter — ſuppoſing any ſuch things to exiſt — to their number, ſize, ſhape, maſs, diſtance apart, mode of motion and interaction, is beyond human ſcrutiny, and, therefore, remote from the domain of exact ſcience.

If ſuch conſiderations have any weight, the theory under diſcuſſion would appear to proceed in a logical manner from purely ſpeculative premiſes to an equally ſatisfactory concluſion. It is not on ſcientific ground until it explains what phyſical and chemical difference there is between a living and a dead plaſſon-body; for the difference muſt be phyſical and chemical only, ſince only phyſical and chemical forces are admitted to be concerned in its production. Chemiſtry and phyſics finding no difference, we may be permitted, indeed we are obliged, to look elſewhere for explanation of the very great difference obvious between a thing alive and the ſame thing dead.

Numberleſs organic compounds have been manufactured in the laboratory which differ in no wiſe from the ſame compounds effected in nature by vital force, excepting that they have never ſhown a trace of life; ſo that I ſhould ſay that the abſence or preſence of that eſſence is preciſely the difference between the artificial and the natural product. In

ſhort, phyſics and chemiſtry have combined to manufacture an egg which will do everything you could expect of an egg, excepting hatch. Pardon me if I go a ſtep further, and ſum the charge thus:

The atheiſtic phyſiciſt, denying mind in nature, declares that matter alone exiſts. Where it came from is no matter. It exiſts; it is matter in motion. Matter in motion is all there is in the univerſe. The Coſmos is matter in motion, in virtue of its material forces alone.* But does it occur to ſuch a phyſiciſt that he has invented juſt what he has always declared to be a phyſical impoſſibility? For he has ſimply invented a huge "perpetual-motion" machine, which runs of itſelf until it wears out or breaks down. Worſe than this, he literally forgets himſelf, the inventor, for he ſays his machine

[* "Give to the ambitious kinematic artiſt his cloud of ſand, — or if he prefer the outfit, let him be furniſhed with an indefinite quantity of a perfectly continuous incompreſſible fluid — bound up if you pleaſe in a chain of 'vortex rings,' — by no motions or compoſitions of motions — continued through the æons of eternity — could he ever manufacture therefrom either a lever or a rope. The kinematic goſpel of a *mechanical* theory of primæval motion is therefore a ſophiſm and illuſion. It is founded on a miſconception of the very *eſſence* of true mechanics. And the ſyſtem that would proudly aſpire to an architecture of a Koſmos from the elements of matter diſrobed and denuded of every quality but motion, would achieve as its higheſt triumph and product — a univerſe of duſt and aſhes." — TAYLOR, *Bull. Philos. Soc. Waſhington*, v, p. 167.]

invented itſelf and ſet itſelf a-going. Then the materialiſtic chemiſt takes this ſelf-invented perpetual-motion machine, and declares that it has laid an egg that will hatch.

Thus far we have only ſtood on the threſhold of life, to witneſs ſuch faint beginnings of vitality as a ſpeck of protoplaſm exhibits. On any theory that the phyſical forces inherent in matter are alone concerned, the way darkens as we proceed from moner to man. Few perſons are more thorough and conſiſtent Evolutioniſts than I may claim to be, and if you give me a *live* plaſſon-body I will engage to make a living human body out of it on the moſt approved biological principles. In fact, we know that the phyſical bodies of all organized beings conſiſt either of a ſingle cell or of a multitude of cells, each of which is, in effect, an individual plaſſon-body, born of a parent like itſelf, living for a while in the enjoyment of its appropriate activities, and then dying. The human body conſiſts of a myriad ſuch plaſſon-bodies, not all alike, indeed, but become very different in form and function in their deſcent with modification from their common progenitors, the female ovum and the male ſpermatozoon — the differentiation of ſtructure and ſpecialization of function of the various tiſſues of the body being ſuch that the reſult may be aptly compared to a ſociety of different ſpecies of amœba-like animals, — bone-amœbas, brain-amœbas, muſcle-amœbas, and the reſt;

all the individuals of which ſpecies of animals are in ceaſeleſs proceſs of birth, growth, maturation, decay, and death. Such language is, of courſe, not figurative illuſtration of an idea, but ſimple ſtatement of obſerved fact. I am ready to believe, and I do, that the chain of life is unbroken from moner to man, miſſing links being only hidden links, ſo far as the genetic relation of the phyſical body of a man to the ſame of a moner is concerned. But now I find myſelf not only toſſed from one horn to the other of a dilemma, but loſt in the intricacies of a polylemma, to extricate myſelf from which all the natural potencies to be found in the phyſics and chemiſtry of matter have, in fact, proven their inadequacy.

Firſt, if the chain of living being has a beginning and an end, anywhere, anyhow, at any time, the links overhauled fall ſhort in both directions. For, at one end, the original arch-amœba is as much of a myſtery as ever; we know not where he came from, how he got there, or in what the eſſence of his plaſſonity ſubſiſts. At the other end, we find our bodies to be a menagerie of amœbas, which we cannot diſpoſe of intelligently, and the finale of which is as much a myſtery as their origination; ſeeing that we know not what, if anything, will happen when our death diſperſes them.

Second, if the chain of living being is endleſs, it neceſſarily

returns upon itſelf, and all reaſoning upon its courſe is reaſoning in a circle. We ſimply ſay that if A is B, B is A; which proves nothing as to the nature of A or B.

Thirdly, no whole can be greater or leſs than the ſum of its parts, or quantitatively different from ſuch ſum. But a particle of living plaſſon is greater than the ſum of all its known parts, poſſeſſing that which none of its known parts poſſeſſes, — Life. And, *à fortiori*, the higheſt and moſt complex organiſm, man, poſſeſſes many things that none of its protoplaſmic parts poſſeſs, unleſs ſuch things as will, memory, and underſtanding — ſuch things as faith, hope, and conſcience, are properties of protoplaſm; it being indiſputable that ſuch qualities and attributes do reſide in human beings, if our conſciouſneſs and our ſenſes have any reliability; and if they have not, we know nothing whatever.

Once more, and eſpecially, if the univerſe is a ſelf-invented perpetual-motion machine — if matter has always and alone exiſted, and has always had the ſelf-determining potency of life, and at length did ſo determine itſelf to become living, and if man, the final outcome, is ſelf-determined protoplaſmic material only, a God is not only ſuperfluous but impoſſible. Yet the reſult of the alleged ſelf-evolution of ſelf-created primordial matter through chemical elements to organic compounds has been the creation of a protoplaſmic mind, ſo con-

ſtituted that in the overwhelming majority of inſtances it can and does, and muſt, believe in a God. If matter be that God, matter contradicts itſelf, for the conſtitution of the human ſoul requires that its God ſhall be other than its protoplaſmic ſelf. If matter be not that God, there muſt be ſome other. A protoplaſmic mind can only eſcape that conviction by denying that itſelf exiſts; which would be abſurd, were it not impoſſible.

The evolution of human reaſon and human faith, in ſhort, of a "rational ſoul," being among the poſſibilities aſcribed to protoplaſm, or ſome ulterior compounding of matter, a train of conſequences ought logically to follow, which, in point of fact, do not follow. The almoſt univerſal ſentiment of mankind is religious in ſome kind or degree, and certain aſpirations are the common endowment of our race. Thoſe whose Deity is protoplaſmic probably never worſhip that ſubſtance, and in fact appear quite indifferent to its divinely tranſcendent attributes; yet ſome form of worſhip is omniprevalent; and if protoplaſm be not a proper object of worſhip as a creative omnipotence, and be not capable of ſatisfying the aſpirations it has evoked, it is fallacious and deluſive, through failure to fulfil its own conditioning of human reaſon and the faith of mankind. In a word, it gives the lie to its own logic.

How it may appear to others, I, of courſe, cannot ſay; appeal to the data of my own conſciouſneſs decides the real gravamen of the objections I have raiſed. Argument is futile. I can only declare that I do not believe my mind to be matter-made only, becauſe it is ſo made that I cannot ſo believe, ſeeing not the ſlighteſt reaſon therefor. If I be wrong, it is ſome conſolation to reflect, that ſo far from my being peculiarly deceived, the conſenſus of mankind has reached the identical concluſion; ſo that any required aſylum of ignorance proves to be the common refuge of humanity. Neverthelefs, ſuch views as theſe, however uſeful or even precious to myſelf, remain mere profeſſions of faith, of little or no conſequence to others, until reaſons are adduced in their ſupport; and iconoclaſm has but its trouble for its pains, if it replace no broken images. I think it will be conceded that all the conceptions of life which have ſwayed the ſcientific and philoſophical minds of men, are more or leſs hypothetical, and in their eſſence purely ſpeculative. This ſeems neceſſary when, in the nature of the caſe, no theorem is demonſtrable, and degrees of reaſonable probability are the uttermoſt approaches to the heart of this faſcinating inſcrutability, reſpecting which the *credo ut intelligam* of the theologian complements the *cogito ergo ſum* of the metaphyſician; belief being no leſs poſtulated by reaſon than is being affirmed in think-

ing. Such apology, if any be needed, is all I have to offer in oppoſing the ſpontaneous generation ſpeculation by the vitaliſtic theory, and propoſing to recognize the hypotheſis of a God-made coſmos, inſtead of the hypotheſis of a ſelf-made perpetual-motion machine.*

Life in the concrete is, of courſe, the ſum of the phenomena manifeſted by animated nature. Of life in the abſtract, of the eſſence or nature of that peculiar attribute of plants and animals, apart from its material manifeſtations, no knowledge whatever ſeems poſſible. Yet, while I cannot even imagine

[* "This ultimate and higheſt induction of ſcientific thought — the Inſcrutable made Abſolute — is reſtful and ſatisfying. This ultimate and higheſt induction — as higheſt and ultimate — cannot be manipulated as a 'working hypotheſis.' This ultimate and higheſt induction — as ſuch — cannot be ſubjected to the ſubſequent verification of mathematical deduction. This ultimate and higheſt induction detracts nothing from the certainty of orderly ſequence ſo irreſiſtibly impreſſed upon us by every deepening channel of reſearch, but gives us rational ground and guarantee of ſuch unfailing regularity. This ultimate and higheſt induction, accepting to the uttermoſt the mechanical interpretation of nature's adminiſtration, — whoſe ceaſeleſs Evolution ſeems ever opening up new viſtas of automatic teleology, — gives ſignificance to our imperfect conception of a regulated ſyſtem, (ſo neceſſarily involved in the very exiſtence and operation of a 'machine,') and accounts conſiſtently for the unfaltering obedience and inſtantaneous reſponſe of all the countleſs atoms of the univerſe to the reign of 'law,' by poſiting behind ſuch law — an Infinite Law-giver." — Taylor, *loc. cit.*, p. 173.]

what life is or may be, apart from matter, ſo far is it from being impoſſible for me to conceive of life as an exiſtent reality apart from any *known conditions* of matter, that it is impoſſible for me not to form that conception. This is of courſe to invoke the "vital principle," to poſtulate the reality of a kind of force called "vital," as a veritable Biogen or life-giver, which may be where no known form of matter is, and can, therefore, exiſt apart from ſuch matter, and not as a reſultant of any material forces. Though this is pure ſpeculation, I am forced ſo to ſpeculate, in the impoſſibility of conceiving the contrary. The conception does not imply that vital force differs from other forms of coſmic energy otherwiſe than as different branches form one ſtream; for all force is one, however diverſe its ulterior operation; the kind of force called "vital" being that ſpecial potency under the agency of which matter aſſumes the form and functions of life in the concrete. Force cannot act where it is not; neither can it act with nothing to act upon; its preſence in and operation upon matter are, therefore, neceſſary conditions of its manifeſtation; all the manifeſtations of life are ultimately reſolvable into modes of motion, and in the particular modes of motion exhibited by living things, *and by no others*, are evidenced the preſence and operation of the vital principle, the energy of which differs from other energies preciſely as the modes of motion

of living things differ from those of all things that do not live. This is not a verbal diſtinction merely; if it ſeems ſo, the fault is in the obſcurity of my expreſſion of the perfectly clear idea every one has of the difference between that which is alive and that which is not. It ſubſiſts in the preſence or abſence of ſomething — ſome real entity, which defies obſervation by the ſenſes, and, therefore, cannot be deſcribed; but the reſults of which are exhibited in the moſt unequivocal manner. If preſſed for more conciſe ſtatement, I may turn the expreſſion, ſaying that life, ſo far from being the *reſult* of the aggregation of matter, in conſequence of any conditionings known as chemical or mechanical, exiſts apart from matter, as a *vera cauſa*, preceding the organization of matter; life being, in ſhort, the *cauſe*, and not the conſequence, of organization. It certainly precedes organization and exiſts in unorganized matter, as any ſcrap of living plaſſon demonſtrates. Furthermore, the higheſt known grade of organization, as the body of a man, though never attained except through vital force, may and does exiſt without life, as any corpſe mutely teſtifies until decompoſition or diſorganization ſets in. If life inhered in matter as the neceſſary reſult of any particular compoſition of matter, death would follow decompoſition, and be otherwiſe impoſſible; but in fact the reverſe is the actual ſequence of events.

If there be any truth in the ſtatement that life is an entity, a reality, apart from any known forms of matter, it is perfectly logical to ſpeak of its preſence in or abſence from any given maſs of matter; and this was my idea when I noted the ſum of a living being as greater than the ſum of its dead material parts. I alſo uſed the word "God" when ſatirizing the apotheoſis of protoplaſm. I have thus far purpoſely refrained from uſing the word "ſpirit." But I cannot proceed with my idea of life without introducing that term, to which I am aware much of the accredited ſcience and philoſophy of the day objects, as being "ſound without ſenſe." Yet no ſcientiſt who acknowledges the validity of the ſcience of pſychology, and no philoſopher who recognizes the validity of abſtract ideas, objects to the word "mind." I muſt therefore be permitted to ſpeak of ſpirit, or "ſoul," if you pleaſe, as ſomething which, like mind, is a legitimate ſubject of inquiry: firſt, as to whether it exiſt or no; ſecond, if it exiſt, whether it be of protoplaſmic nature or no; third, if it be not that product of the aggregation of matter, what ſort of a product it may be; for I conſider this inquiry eſpecially pertinent to any diſcuſſion of life. Our alternative, you know, is, that all vital phenomena, all manifeſtations whatſoever of life, are to be counted among the accompliſhments of protoplaſm, or are to be otherwiſe accounted for.

Much difference of opinion as to the reality of "ſoul" might be reconciled if diſputants could catch each other's meaning and agree upon a definition of the term. But this is very difficult, though we all think we know what is meant when a human ſoul is in mention. Many deny there to be any ſuch thing; many waive the queſtion, neither affirming nor denying; moſt aſcribe a ſoul to man alone; ſome concede a ſoul to every atom of inorganic matter as well as to all organized bodies. My view defines ſoul as the quantity of "ſpirit" which any living being may or does poſſeſs at any time. But this requires a definition of "ſpirit," ſome quantity of which is to make a ſoul, juſt as ſome amount of matter makes a body. I can attach no idea to the term "ſpirit," from which all conceptions of matter are not abſolutely excluded. Spirit is nothing if not immaterial. Force is likewiſe immaterial; but I think nearly all perſons recognize a diſtinction between ſpirit and any mechanical force, ſuch as gravitation. My mind affords no definition of ſpirit, if I may not call it *ſelf-conſcious force.* Self-conſcious force being illimitable in time and ſpace, and its ſum being, in a word, infinite, I am unable to draw any diſtinction between ſpirit in its totality and that Univerſal Mind, or Supreme Intelligence, which we mean when we ſpeak or think of God.

To my mind, "mind in nature" is a ſelf-evident propoſi-

tion — a logical neceſſity. The ſimple fact that we can *think* a God, neceſſitates the concluſion moſt men have reached, of the exiſtence in nature of other than what are called "natural forces;" of the reality of the exiſtence of ſpirit as ſelf-conſcious force; though I do not ſee why it is not as "natural" a force as gravitation. It is certainly not unnatural; and to call it "ſupernatural" only expoſes our ignorance of Nature — Nature being, on any theiſtic hypotheſis, ſimply the ſum of the manifeſtations of the will of God. The French epigram, "If there be no God man muſt invent one," may be pharaphraſed to ſay, "If there were no God man could not invent one." I cannot ſuppoſe my mind to be peculiarly conſtituted; and, as I find the conceptions juſt noted preſent in it, as propoſitions which are nothing if not ſelf-evident, if not axiomatic data of conſciouſneſs, I preſume the ſame idea can or does preſent itſelf to moſt other perſons. But by our definition, "ſoul" is a portion of ſpirit, and ſpirit is ſelf-conſcious. I am likewiſe ſelf-conſcious; and by that quality of being I know, with a certainty no doubt can diſturb, with a certitude no argument can increaſe or diminiſh, that I have a ſoul. For to doubt is to judge; to judge is to reaſon; while the knowledge I have of my own ſoul comes not by taking thought; it is the ſoul's ſelf-conſciouſneſs. Some call it "faith;" I have no objection to that term; it is ſomething ſo

precious, ſo ſuperior to reaſon, though never irrational, that I would greatly prefer to recognize it as a property of protoplaſm than to loſe it.

Finding myſelf alſo in poſſeſſion of a body, of the actual exiſtence of which body few perſons, excepting ſome German metaphyſicians and their ſuckling converts, are in doubt, and alſo obſerving that this body is alive, that is to ſay, that it manifeſts all the phenomena neceſſary to our conceptions of life, I am bound to infer, and I do infer, that in my own caſe at leaſt, life ſubſiſts in the union of ſoul and body; that life conſiſts in the animation of matter by ſpirit; that life is God made conſciouſly manifeſt. If there be any truth in this, I ſuppoſe it is equally true of other human beings, though I only anſwer for myſelf.

My mind refuſes to believe, what ſome may object, that ſuch expreſſions as I have uſed reſpecting the reality of ſpirit are mere abſtractions — mere metaphyſical ſubtleties metaphorically expreſſed — in other words, mere figments of the imagination. I would ſooner grant, what ſome metaphyſicians fancy they have proved, namely, that we have no bodies. To do away with the body altogether — at any rate, with every body excepting one's own, appears to be one of the accompliſhments of ſome ſchools of thought. Such exploiting in the ſaw-duſt of an intellectual gymnaſium ſeems to me

a ſimple and eaſy trick, in compariſon with the effort to deny the ſoul; for the body is but an accident of matter, and the proceſs of annihilating it in imagination only anticipates a natural proceſs by a brief ſpan of time, and time is nothing but a ſequence of events which cannot occur if there be nothing to happen. But to do away with ſpirit, even in imagination, is not naturally poſſible. It is futile to attempt, as ſome "philoſophers" have done, to avoid all poſſible contradictories, and evade the poſſibility that "pure reaſon" may be fallible or fallacious, by denying the exiſtence of the ſubject of every poſſible predication, thus evolving a "philoſophy" of which univerſal negation is the ſole final outcome. What philoſophy — what "love of wiſdom" — is here, when we are left nothing to love! For the act of denial, or even refuſal to affirm, implies a denier or a refuſer, as an exiſtent reality, and the denial or refuſal is itſelf an exiſtent reality. True it is, and diſmally true, that the philoſophy of univerſal negation, by ſome called "criticiſm of pure reaſon," is intellectual nihiliſm — a ſort of philoſophic fool's paradiſe, or earthly Nirvana, where one has not even the Buddhiſtic privilege of mumbling "Aum," for fear there may be ſome miſtake about it. Such a ſtate of mind is not even an aſylum of ignorance in which poor humanity may take refuge; it is an aſylum in which intellectual impotency holds not the mirror up to nature but to its confeſſed ſelf.

But this is unpremeditated digreſſion. The point I wiſhed to make, when thoſe contemptuous thoughts obtruded, is, that as denial implies a denier, and as both are real entities, though denial is an abſolute immateriality, the real entity of ſuch an equally abſolute immateriality as I hold ſpirit to be is not *à priori* impoſſible. It *may* exiſt therefore; I have poſtulated that it actually does exiſt, and defined it as ſelf-conſcious force; I have ſpeculated that a living body reſults from the action of ſpirit on matter, and that life ſubſiſts on the union of the two. To bring the queſtion into ſome ſcientific ſhape — to put it on the border-land between metaphyſics and pſychology, if not really in the domain of the latter ſcience, let me ſay a few words reſpecting the connection between mind and matter.

The only points toward which all differences of opinion in this vexed queſtion converge are the intimacy of the connection and the intricacy of a relation in which the two factors — mind and matter — are inter-dependent and inter-active. For even thoſe who hold, as I do, that mind does not depend upon matter for its exiſtence, but only for its manifeſtation, if they know anything of anatomy and phyſiology, know how powerfully phyſical ſtates affect mental operations. Thoſe who maintain the chemico-phyſical theory of life neceſſarily conſider all mental, like all phyſical phenomena, as the re-

ſultants of the play of mechanical forces, and as ultimately referable to mere motion of material particles — ſuch mental endowments as will, memory and underſtanding, judgment, intuition, perception, conception, conſcience and conſciouſneſs itſelf depending for their exiſtence upon how ſtands the parallelogram of forces, how goes the balance of power in the mad claſh of blind atoms. My hypotheſis, which recognizes the exiſtence of ſpirit as determining life, and makes life the cauſe inſtead of the conſequence of organization, enables us to reconſtruct the parallelogram of forces, and ſtrike the balance of power not between the mechanical forces of the material particles themſelves, but between theſe and the conſcious power of ſpirit — the Will of the Ego. This is the reſultant which apparently conſtitutes "mind." Viewing the intenſe and vivid molecular activities, the combuſtion and deflagration of tiſſue, which attend the generation of every thought, and are neceſſary to the manifeſtation of thought, though in no ſenſe its originators, it is ſcarcely uſing metaphorical language to ſay that mind reſides at the melting-point of matter in ſpirit.*

[* See Appendix, 6th paragraph. In penning "Biogen" for oral delivery, I purpoſely followed that common uſage of the words "ſpirit" and "ſoul" which makes theſe two terms nearly ſynonymous, or at any rate alternative, expreſſions for all that there is of a man which may ſurvive

To illuſtrate ſuch fuſion as I have imagined, let us conſider the two oppoſite things which, according to univerſal experience, concur in the alembic of mind. I refer, of courſe, to any ſubjective and any objective cognition. Let us formulate any ſubjective cognition in the general expreſſion "I will," and any objective cognition in the term "I ſee."

Aſide from the ſummary cognition "I am," nothing can be conceived more original, ſpontaneous, independent, and ſelf-determining than "I will." This cognition affected, at whatever expenſe of brain-tiſſue, *will-power* has been conſciouſly called into being; it has been created; it exiſts as a real entity, at the ſervice of its originator, to be utilized as he determines. This ſeems to be the pureſt example of *force* of which any one can be conſcious. To think "I will" is to command force. But ſo long as this conſcious determination remains inoperative, it is only potential energy or latent force, which may or may not become active and effectual. If it do not act effectively upon *ſomething*, no manifeſtation of power is poſſible, and the very exiſtence of the energy is unknowable,

the death of his body; not deſiring to open any diſcuſſion of the point involved here. The diſtinction I make is formulated and definitely ſet forth in the Appendix, where alſo will be found ſome further reflections upon the meaning of the word "mind" — mind not being a thing which thinks (for that would be ſpirit), but the expreſſion of what is thought.]

excepting to its creator; it is only ſelf-exiſtent, in ſhort. *Once tranſlated in terms of matter*, with motion or any other cognizable effect, the exiſtence, operation, and reſult of a cauſe are diſcovered. If we knew how this tranſlation is accompliſhed, we ſhould know exactly how the connection between mind and matter is made; but we do not, and can only reſt in the knowledge that ſomehow the brain is the material mechaniſm by which the will of the owner of that apparatus is primarily manifeſted. Will-power is carried out further by the reſt of the bodily machinery, and may be finally accompliſhed in a thouſand ways. But obſerve, that all ſuch manifeſtation of force is the manifeſtation not of mechanical or chemical force merely, but of *intelligent volition;* that is to ſay, of ſelf-conſcious force; which, according to our definition of ſpirit, is ſpirit.

To many minds it might be to ſow the ſeeds of reverence for the exalted dignity of humanity to reflect that ſuch mental operation as I have deſcribed is the counterfeit, in the finite human microcoſm, of the deſcribed creation of the macrocoſm by infinite power divine. The Univerſal Mind, the Supreme Intelligence, the great I Am, which was and is and ſhall be always, determined, it is ſaid, to become manifeſt. He ſaid "let there be," and there was, as He willed. And man is ſaid to be made in His image.

Now let us glance at the other chain of ſequence — that involved in the term "I ſee," as the general expreſſion for all ſenſe-concepts. One would think this a very ſimple propoſition; ſo it is, if its full meaning be graſped; but half graſped, or even only juſt miſſed, the propoſition is unintelligible. Such appears to be the difficulty with thoſe who, for the ſimple truth "I ſee," try to ſubſtitute the untruth "the brain ſees;" for they fail to ſee at all through the maſs of ſquirming brain-amœbas which are tormented to death in the proceſs of their reflections on the ſubject. No one ſuppoſes the eye ſees, any more than any other optical inſtrument ſees; nor the optic nerve, any more than the eyeball; nor the corpora quadrigemina than the nerve; yet there is a blind kind of phyſiology which ſeems to think that viſion, the faculty of ſeeing, which cannot be found at the outer end of the optical inſtrument, muſt lurk about the inner end of that exquiſite apparatus. But I muſt believe, as I do, that, trace the nervous threads as far back as you pleaſe, and locate the exact ſpot in the brain where they end, there would be no *ſeeing* done if ſome Ego — that identical ſpiritual Ego I poſtulate — were not looking through the teleſcope life has organized for the purpoſe, and as fully conſcious of ſeeing as I am at this moment. In fine, I know that it is *I* who does the ſeeing, with the ſame certitude that I know who is ſpeaking; and I

do *not* believe any one of you to be differently conſtituted in this reſpect. Truly, the difficulty of underſtanding *how* the phyſical terms of a retinal image can be tranſlated into the mental terms of conſcious viſion, has never been overcome; our ignorance is abſolute; if it ever is overcome, no doubt we ſhall learn what and where is the connection between mind and matter.

I ſpeculate that not only is it among the poſſibilities of living protoplaſm to eſtabliſh that connection, but that among the qualities of that pregnant ſubſtance, or of ſome of its material derivatives, is one adequate to the eſtabliſhment of the required relation. Chemiſtry has ſhown the compoſition of the dead ſubſtance — the number and proportion of the elements compoſing it — even the mode in which its molecular units are, or may reaſonably be inferred to be, compounded. The extreme inſtability of the reſulting combination, and the extraordinary activities acquired, are well-known. If we can be permitted to vivify ſuch a dead ſubſtance as this with biogen or any thing elſe, it is difficult to ſet any bounds to its poſſibilities as a mediator or go-between mind and matter — in ſhort, between the ſpirit and the body. I hypothecate for living protoplaſm — for the dead ſubſtance the chemiſt knows *plus* biogen, a vaſtly greater degree of molecular inſtability, and immeaſurably more ener-

getic molecular or perhaps atomic activity, than have been aſcribed to the dead tiſſue, ſimply as an extenſion of the conditionings which have been aſcribed to dead protoplaſm as laws of its chemico-phyſical being. I ſpeculate upon the reaſonable probability that under the influence of vital force protoplaſm may and does acquire ſuch tenuity of ſubſtance, ſuch mobility and activity, as to be fairly deſcribable as matter at a minimum of denſity combined with force at a maximum of intenſity; and to be comparable in ſuch vital ſtage of its evolution to that interſtellar fluid which is ſcientifically recognized as the medium of the transfer of force everywhere. If the undulations of a luminiferous æther — a ſubſtance vaſtly more tenuous than any we know by our ſenſes, yet ſubſtantial ſtill, and perhaps ſtill far from the dividing line between matter and ſpirit, where pure ſpirit is purged of the laſt dregs of materiality — if ſuch an æther, the very exiſtence of which is hypothetical, yet an accepted ſcientific fact, becauſe no other effort of the imagination ſupplies ſo good an hypotheſis on which to explain the phenomena of light — if this æther can be logically inferred to exiſt, it is no romance of the imagination to infer that matter may be animated to the degree of ſublimation required for its vibration to will-power — its thrilling to a thought.

Such ſtate of matter as I imagine and deſcribe would ſatisfy

at leaſt one of the important factors of the life-problem, by eſtabliſhing a connection between mind and matter. The thing is already done when a ſingle atom of matter is moved in the leaſt by the ſlighteſt conſcious force.

I have often thought that the phenomena of life may be inſtructively compared with thoſe of light, there being ſome highly ſuggeſtive paralleliſms between the two things. Life and light are curiouſly coupled in vulgar parlance, an unſophiſticated mind vaguely perceiving ſome ſimilarity, juſt as it couples the correſponding negations, death and darkneſs. Old and early as is light — not impoſſibly antedating moſt other coſmities or orderings of things — how new and late are not the concluſions of ſcience reſpecting its phyſical baſis! Light was only diſſected yeſterday, to diſcover all prior text-books of its anatomy to be wrong. To-day no one queſtions the exiſtence of luminiferous æther as a real ſubſtance, in the vibrations of which the quality of light ſubſiſts and is manifeſted. But this ſtate of matter is impalpable, inviſible, inaudible, inodorous, and inſipid — in ſhort, inappreciable to the phyſical ſenſes. We know nothing about it, as matter; we only know it is a mode of motion of matter in an unknown ſtate. Force is obviouſly preſent and operative; matter is only an inference. But a ſubſtantial æther is a dictum of ſcience, ſigned, ſealed, and delivered. A vivid exerciſe of the

imagination it muſt have originally been, and a lively act of faith in the evidence of things unſeen, to ſet the matter before the reaſon, judgment, or critical faculty in ſuch ſhape that the mind could not only affirm the verity, but be unable to deny the truth, as to the nature of light. How many men, in the hiſtory of intellectual achievement, are found capable of ſuch ſplendid believing that they may underſtand — yet *credo ut intelligam* is required to unlock any of the great ſecrets of Nature, no leſs than is it neceſſary to penetrate the world of ſpirit. In the nature of the human mind ſuch rational faith is the key of diſcovery. Imagination engenders, belief cheriſhes, obſervation nouriſhes, reflection educates, and judgment approves — then the reſult takes care of itſelf, as a mature ſcientific truth. The accepted theory of light, in ſimpleſt expreſſion, is, an unknown but believed-in ſtate of matter in a known mode of motion — it is matter at an ineſtimable minimum of denſity moving with extraordinary velocity under a force of enormous intenſity.

On the other hand, the groſſly material baſis of life is perceived by all experience — the body of any plant or animal ſhows what number and kind of known ſtates of matter may be informed and inſtinct with the life-principle, among which are ſand and lime and iron, and many others, beſides thoſe compoſing the ſuppoſed ultimate phyſical baſis of life, proto-

plaſm; while what amount of motion is imparted by what kind or degree of force has proven thus far ineſtimable. What may actually be the facts in the caſe, however, ſo far from being inconceivable, is to my mind a very thinkable propoſition, with the poſſible truth of which no known phenomena of life are neceſſarily irreconcilable.

Thus, ſince I cannot imagine force primarily acting upon matter in bulk — like kicking a ſtone — it is neceſſary to infer, for the validity of the vitaliſtic theory of life, an exceſſively tenuous ſtate of matter ſet in motion by an exceſſively active force — juſt as I did when ſpeculating upon the connection I imagined to exiſt between mind and matter. Such conditioning of matter and force would be ſtrictly comparable to what is known of the nature of light. It would be the analogue of — perhaps the homologue of — poſſibly identical with — that interſtellar fluid which is recognized by ſcience as the univerſal medium of tranſmitting energy. It would, however, differ from light in ſeveral important and eſſential particulars. To ſatisfy the conditions of the theory, the ſubſtance or phyſical baſis of biogen would be perhaps as much more tenuous than luminiferous æther as is the latter more fluidic than hydrogen; it would be at the actual minimum of denſity at which it is poſſible for force of any kind to be tranſmitted, and ſo operative and manifeſt. The velocity

of motion would be only leſs than infinitely greater than the known velocity of light, for it would be at the rate of ſpeed at which thought can be tranſmitted. And as to the kind of force which would effect ſuch motion of ſuch matter, it would differ from any kind generally recognized, in that it would be ſelf-conſcious; that is to ſay, it would be pure ſpirit.

According to the terms of my ſpeculation, the vital principle is a real entity — an *ens realiſſimum*, the incorporation of which in protoplaſm or any other combination of groſs matter makes ſuch matter "alive," and the diſſolution of which from ſuch matter leaves the latter "dead." Biogen itſelf, of courſe, is alive; it *is* life; and biogen may be defined as ſpirit in combinatiou with the minimum of matter neceſſary to its manifeſtation. Biogen is ſimply ſoul-ſtuff,* as contradiſtinguiſhed from ordinary matter; it is the ſubſtance which compoſes that thing which a well-known and very frequently quoted writer calls the "ſpiritual body."

I have ſpoken to little purpoſe, and my expreſſions have been ill-choſen, if what I have ſaid ſeems novel to you; if you do not diſcover in what I have ſaid ſimply a reſtatement,

[* "Mind-ſtuff," and the "hypothetical ſubſtance of mind," are expreſſions already in current uſage among ſcientific writers of repute. What is meant by theſe terms I cannot imagine, unleſs indeed it be that very real thing which I here call "ſoul-ſtuff."]

in ſomewhat "ſcientific" language, of one of the oldeſt, and I think one of the wiſeſt, of the world's conceptions of the life-principle, as a direct effluence of the Deity. It is the old *anima mundi*, ſoul of the world, "workſhop of nature," where the will of God is firſt faſhioned in form and ſubſtance to receive the breath of life. And it is inſtructive to note, that in the whole hiſtory of human notions reſpecting the origin and nature of life, the theory of ſpontaneous generation, which the ſtrongeſt ſcience of to-day moſt ſtrongly diſclaims, is the one which has taken the leaſt hold upon the human mind. Biogenetic ſpeculation has almoſt invariably flowed in the ſtream which bears the idea of father and ſon upon its boſom. Let us not deceive ourſelves with the giving new names to old things. Call them what you pleaſe — modern materialiſtic and atheiſtic notions about life are every one of them diſguiſes of the plain ſtatement that a ſelf-created atom of matter lays an egg that will hatch. Call this a monſtrous abſurdity, an inſtigation of the devil, if you chooſe; I can call it neither ſcience, nor philoſophy, nor religion, nor anything that is learned, wiſe, or true.

To my mind the *anima mundi* belief, as I reſtate it in terms of the biogen theory, acquires color from the conſideration that it is exactly the complement, and perhaps the natural antinomy, of generally received views reſpecting the evolution

of chemical elements and chemical compounds from indifferent ſtates of nebulous matter; and not unlikely to be quite as true. The progreſſive conſolidation of matter, during which the moſt diffuſe, moſt tenuous and indifferent ſubſtances are gradually differentiated and then combined to form the various products known as "elements," to be recombined in endleſs diverſity to form "inorganic" and "organic compounds"—ſuch proceſs would ſeem to involve as its neceſſary conditioning the univerſal antinomy, that at a certain ſtage of molecular aggregation reached by certain forms of matter, the counteractive vital principle comes into operation to arreſt the conſolidation, to bring matter out of the depths of groſs materiality it has reached to the ſublimity of effectual contact with ſpirit. Whence emanated matter in the beginning is inſcrutable; from nowhere, certainly—if not from the ſelf-conſcious, ſelf-determining univerſal Mind which willed to ſo become manifeſt. Where to? Nowhere, certainly—if not to whence it came, to complete the circle, ſymbol of infinity, whoſe quadrature is unknown.

Equally unknown are the time, the place, the circumſtance of the origination of life. We may learn of theſe things when we diſcover what is matter divorced from force; for of neither of theſe things, apart from the other, if they be not one in eſſence and that eſſence pure ſpirit, do we know

anything at all. The vital principle, which I muſt inceſſantly invoke to ſatisfy the fundamental data of my conſciouſneſs, is equally inſcrutable; but it is peculiar, in that it is not known to be manifeſted except in conſequence of itſelf, or to reſide long in any one glomeration of groſs matter, or to ever die. I am bound to conſider it as the moſt direct and immediate natural manifeſtation we have of the Great Firſt Cauſe, and conſequently to refer it at once far back of any ſuch ſecondary cauſe as a mechanical or chemical law. I cannot ſuppoſe it will ever be determined either to originate in protoplaſm or any other material compound, or to permanently reſide in anything that retains the leaſt veſtige of materiality. Being abſolutely beyond the ſcrutiny of the phyſical ſenſes, it would ſcarcely appear to fall within the ſcope either of ſcience or philoſophy; and I doubt that human reaſon, unenlightened by revelation, can learn much about it; for that would be to find out God by taking thought.

Since the retiring Preſident of this Society has declared that neither ſcience nor philoſophy affords any foundation of proof upon which my conſcious mind may build hopes of that immortality of the ſoul which is to that ſame mind a neceſſary conditioning of its exiſtence, it is to be hoped that ſcience may yet diſcover facts enough, and philoſophy find truth enough, to render that happy reſult poſſible; for until they

do, they are together obviouſly incompetent to deal with the life-problem; and until they do, fellow-men muſt be permitted to interpret the great ſecret each after his own methods, as beſt ſuits his own neceſſities; even ſhould theſe force him to take refuge in ſome credible formulation of faith, as in ſomething which certainly promiſes more than ſcience and philoſophy have accompliſhed, and may contain the germs of a good working ſcientific hypotheſis.

But there is ſcience and ſcience, more or leſs intelligent or intelligible. There is philoſophy and philoſophy — that of Socrates, and that of Kant, for example. In ſuch wealthy embarraſſment, the real lover of wiſdom may be inclined to ſeek the truth in ways that vex his mind leaſt, and at leaſt leave him at peace with his ſoul, ignorant though he be of its origin, nature, and deſtiny.

Here, gentlemen, I ſhould ceaſe ſpeaking. But my ſpeculations have been ſurrendered to your criticiſm; and, as I know that many colors are reflected in the mental ſpectrum of the philoſophers preſent, I beg you, in the diſcuſſion about to enſue, to reſolve my doubts in the following particulars:

What is the difference between a Godleſs, ſelf-created, always-exiſtent coſmos of matter-in-motion alone, and any

perpetual-motion machine which men have dreamed of inventing, but which philoſophy declares impoſſible?

What is the difference between any mechanical or chemical theory of the origin of life, and that ſpontaneous generation of life which ſcience declares to be unknown?

What is the chemico-phyſical difference between a live amœba and a dead one? And if there be no chemical or phyſical difference, in what does the great difference ſubſiſt?

What is the principal difference between a living human being and his dead body, if it be not the preſence or abſence of the ſoul? And if it be nothing like this, what, then, is it more like?

APPENDIX.

A MAN'S "mind" is not a *thing*, in the ordinary ſenſe of the word thing. It is a relation between two things. Theſe two things are, his ſoul and his body. The mind is the reſult of the interaction between ſpirit and matter. It is what the ſpirit thinks in conſequence of its connection with matter. It is the knowledge which the ſpirit acquires by its experience in contact with matter. It is what the ſpirit muſt become incarnated to diſcover and appropriate. It is what the ſpirit retains when it becomes diſembodied. It is the knowledge of good and evil. It is the fruit of the tree of life.

Reaſon is the miſtreſs of the mind, and its exerciſe is judgment, or the critical faculty. But its data are only thoſe which it receives through the avenues of ſenſe. The bodily ſenſes are obviouſly and notoriouſly fallible. Reaſoning upon ſuch data as the bodily ſenſes give may therefore be equally deceptive; and thus the reſults of reaſon are often fallacious, though its proceſſes may be perfectly logical. Hence what any man *thinks*, *i.e.*, his mind, may be very wrong indeed, ſince it is neceſſarily baſed upon the experiences of his ſpirit with matter.

On the other hand, a man's ſoul is a thing, in a proper ſenſe of that word. It is a ſubſtantial reality, an actual entity, a living being of knowable and recognizable qualities, attributes and potencies. It is not merely

a thought, or an idea, or any metaphyſicality. It conſiſts of a kind of ſemi-material ſubſtance, which is the body of the ſpirit, bearing much the ſame relation to pure ſpirit that the phyſical body bears to the ſoul itſelf. The ſubſtance of the ſoul is the means and medium of connection or communication between ſpirit and matter. Soul-ſtuff is animalized aſtral fluid; that is to ſay, ſome quantity of the univerſal æther, modified by vital force, individualized by a man's ſpirit, and appropriated to the uſes of an individual ſpirit, juſt as a certain quantity of groſſer matter is individualized and appropriated to the formation of the phyſical body. The ſubſtance of the ſoul, to which I apply the name 'biogen,' ſeems to correſpond cloſely to what Prof. Crookes calls the 'fourth ſtate of matter;' and ſome demonſtrable activities of matter in this radiant ſtate appear to be ſummed by him in the term 'pſychic force.' It is the 'od' of Prof. Reichenbach, and many of the manifeſtations of its activities are grouped under the expreſſion 'odic force.' It is what ſome appear to mean by the term 'hypothetical ſubſtance of mind.' It ſerves as an 'æſthetophore' — to borrow a word coined by Prof. Cope. One of its modes of motion was demonſtrated by Galvani. The commoneſt and beſt-known exhibitions of its active agency are thoſe of our bodily ſenſations and movements, its currents to and fro between a human ſpirit and that ſpirit's carnal envelope being deſcribed by modern phyſiologiſts as ſenſory and motor nerve-impulſes.

Some modification of ſoul-ſtuff exiſts in all animals and plants — in all things which have life, if not alſo in thoſe other things which we call inanimate. In the higher animals — in man at any rate — it becomes the vehicle, the envelope, and the inſtrument of ſpirit, indwelling in the phyſical body ſo long as that body is "alive," and leaving it at what is called death, which is when the ſpirit entirely withdraws from the phyſical body, carrying its ſoul-ſtuff along. Thus a man, in this world and in the fleſh, conſiſts of three different and ſeparable things. 1st. His phyſical body, certain tranſient atomic and molecular aggregations of ſolid, fluid, and

gaſeous matter. 2d. His ſoul, a certain ſubſtance temporarily in contact and very intimate connection with his body, on the one hand, and with his ſpirit, on the other, ſerving as a medium between the two. 3d. His ſpirit, of which he knows nothing, though his ſpirit knows itſelf perfectly well. "Death" is ſimply the diſengagement of the third and ſecond of theſe from the firſt. The deſerted phyſical body, no longer animated by the ſpirit acting through the ſoul, is "dead"; it has loſt its "vitality"; the "vital principle," which is ſimply the force by which the ſpirit acts upon matter through the medium of the ſoul, is no longer operative; and the body in this ſtate, *i.e.*, dead, is only acted upon by phyſical and chemical forces. It then furniſhes a very proper ſubject for the chemico-phyſical theory to explain and account for.

"Mind," as the expreſſion of a relation between the ſoul and the body, neceſſarily diſappears when that relation is diſcontinued. But a far higher order of intelligence, volition and will-power is manifeſted by the ſpirit as ſoon as it is ſeparated from the phyſical body. Having then a dual being only, inſtead of a triple mode of exiſtence; replacing mere mental reaſon with thoſe higher ſpiritual faculties whoſe glimmerings and faint foreſhadowings in this life it uſed to call "imagination"; contraſting more clearly than it could while in the fleſh the meanneſs of the intellectual with the majeſty of the moral faculties; appreciating the great gulf fixed between good and evil; limited in its activities neither by the three dimenſions of ſpace to which it was confined while in the body, nor by the modes of motion then known;—the human being has entered upon another ſphere of exiſtence by an evolutionary proceſs as natural as that by which he paſſed from the womb to the world. The tranſition is probably leſs abrupt, in moſt caſes, and there is no reaſon to ſuppoſe that the change is any greater. The body does not appear to be any more neceſſary to the exiſtence of the ſoul in the other world than is the after-birth to the exiſtence of the body in this one.

From what has preceded it is evident that what I mean by "ſoul" is

not exactly according to the general uſage of the word; which uſage commonly makes "ſoul" and "ſpirit" one and the ſame. Thus, when we ſpeak familiarly of "a man's ſoul," we alſo ſay it is "his immortal ſpirit," meaning thereby, anything and all there is to a man which is capable of ſurviving death. But, as already ſtated, I draw a wide diſtinction between "ſoul" and "ſpirit." Spirit is nothing if not immaterial, and to "ſpirit" proper we can attach no ſignificance if we do not conſider it as diveſted of every trace of materiality. Soul, on the contrary, is ſubſtantial, and ſemi-material; it is the "body of the ſpirit," neceſſary, ſo far as we know, to all and every manifeſtation of the ſpirit. Spirit cannot act directly upon matter, but only through the intermediation of this ſoul-ſubſtance. A human being, after "death," conſiſts of this ſubſtance, acted upon by his ſpirit, the two together conſtituting what is ordinarily called his "ſoul." To this ſubſtance, when acted upon by, and ſerving for the manifeſtation of, ſpirit, I give the name of biogen. The ſame ſubſtance (biogen) acted upon by the ſpirit before the death of the body, and ſerving for the operations of ſpirit upon matter, is the "vital principle," the action of which we call "vital force," and the reſults of which action we call "vitality" or "life."

I do not admit for an inſtant that biogen is merely an idea, or thought, of mine or any one elſe — a metaphyſical abſtraction, a mere mode of expreſſion, or a mere mode of motion either. It is not, furthermore, a relation ſubſiſting between two things. Nor is it a "force," in the ordinary ſenſe of the term. It is a THING, a very real *thing*, an *ens realiſſimum*, poſſeſſed of ſenſible qualities and attributes which may be inveſtigated by proper ſcientific methods, and by ſcientific experimentation, quite as readily as any other of the ſo-called "imponderables" of nature. It is as open to examination as luminiferous æther, and its properties, if not its ſubſtance, may be ſtudied as we would ſtudy light, heat, or electricity; it is therefore not only a proper object of ſcience, but a proper ſubject of philoſophy.

Under ordinary circumſtances, biogen is inappreciable to the phyſical ſenſes, however manifeſt its effects. Under exceptional circumſtances it acquires very ſenſible properties, the principal of which are viſibility and tangibility. It may then be both ſeen and felt. Its modes of motion appear to differ in ſome reſpects from any of thoſe known to us to be poſſible to groſs matter, and to require for their complete exhibition more than three dimenſions of ſpace. Its exceſſive tenuity, extraordinary elaſticity, compreſſibility, homogeneity and ſome other qualities, lead me to ſuppoſe that one great difference between biogen and moſt known ſtates of matter may be, that it is not of atomic conſtitution. If hydrogen, the moſt ſubtile and tenuous gas known, cannot exiſt in a free ſtate except two of its atoms be joined in a molecule — and this is good ſound chemiſtry of the day — it may be that biogen conſiſts of free atoms; that is to ſay, differs chiefly from other kinds of matter in having no molecular conſtitution. More probably, however, — viewing ſome of its properties and activities — it is to be conſidered not even atomic in conſtitution — having no atoms of any ſize or ſhape or diſtance apart — no fixed points of greater denſity than their intervening ſpaces. In this view, biogen would be ſimply *tomic matter* as diſtinguiſhed from atomic matter; and to ſo regard it may be well, for the preſent at leaſt.

During the earthly life of the individual, a perſon's biogen appears to be normally confined to the limits of his phyſical body; or at any rate to make but faint and feeble excurſions therefrom during his waking hours. In ſleep, however, when the ſpirit is temporarily withdrawn from the outer world by the cloſure of the uſual avenues of the ſenſes, the biogen is much freer in its excurſions, and may almoſt entirely leave the body at the will, conſciouſly or unconſciouſly exerted, of the ſpirit. Probably no perſon "is himſelf" ſo much as in his dreams, under theſe conditions; a fact which Shakeſpeare doubtleſs knew, familiar as he was with the properties of biogen, when he wrote that we are ſuch ſtuff as dreams are made of. More obvious though leſs familiar exhibitions of the excur-

ſions of biogen from its uſual abode in the body are witneſſed in various phenomena of ſomnambuliſm, ſpontaneous or induced; in clairvoyance, clairaudience, trances of various kinds, religious ecſtaſy, ſome forms of catalepſy and epilepſy; and eſpecially in what is called "ſuſpended animation." Some perſons are ſo conſtituted that they can project their biogen at will; others, that it flows from them unconſciouſly, againſt their will, during their waking hours; others again, that it can be drawn out of them neither by nor againſt their will, but under circumſtances they have learned to recognize and to which they may voluntarily ſubject themſelves. In highly exceptional caſes, frequently but not neceſſarily preceding death, biogen may proceed from a perſon in ſuch quantity and of ſuch quality as to be viſible and even tangible to another perſon. At death, it entirely withdraws from the phyſical body, with more or leſs rapidity; and the act of dying is not accompliſhed until this proceſs is completed; when the individual is at length dead, his ſpirit continues to live in a body compoſed of biogen; and this "ſpiritual body" may, and frequently does, become viſible and tangible to thoſe whoſe ſouls ſtill inhabit their phyſical bodies. The ſubſtance which I call biogen, therefore, is an available, a legitimate and an appropriate object of ſcientific inquiry, by no means to be ignored in any ſyſtem of philoſophy, and by no means to be miſtaken for protoplaſm.

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